

What is claimed is:

1. A transmit-receive FM-CW radar apparatus which switches between transmission and reception by time division control, comprising: a mixer for downconverting  
5 an IF signal; a switch provided on an input side of said mixer; and a switch controller for controlling said switch on and off in different modes and selecting said IF signal in said different modes for supply to said mixer.
- 10 2. A transmit-receive FM-CW radar apparatus as claimed in claim 1, wherein said radar apparatus comprises a plurality of said mixers, each for downconverting said IF signal, and a plurality of said switches one each provided on the input side of each of  
15 said plurality of mixers, and wherein said switch controller controls said plurality of switches on and off in different modes and selects said IF signal in said different modes for supply to said plurality of mixers respectively.
- 20 3. A transmit-receive FM-CW radar apparatus as claimed in claim 1, wherein said radar apparatus comprises: a plurality of said mixers, each for downconverting said IF signal; a selector switch for supplying said IF signal to each of said plurality of  
25 mixers by switching a connection thereof between said mixers; and a switching controller for controlling timing for connecting said selector switch to each of said plurality of mixers, and for causing said selector switch to select said IF signal in said different modes for  
30 supply to each of said plurality of mixers.
- 35 4. A transmit-receive FM-CW radar apparatus as claimed in claim 1, wherein said mixer is a single mixer, and said radar apparatus includes: a switch, provided on the input side of said single mixer, for turning on and off said IF signal to be input to said mixer; and a mode selector for controlling said switch on and off in different modes while selecting said on/off mode by

switching between said different modes.

5        5.    A transmit-receive FM-CW radar apparatus as  
claimed in claim 1, wherein said mixer is a single mixer,  
and said radar apparatus includes: a switch, provided on  
the input side of said single mixer, for turning on and  
off said IF signal to be input to said mixer; and a mode  
controller for turning said switch on and off in a  
specific mode.

10       6.    A transmit-receive FM-CW radar apparatus as  
claimed in any one of claims 1 to 3, wherein said  
different modes consist of a short-range mode for  
selecting an IF signal containing a signal from a short-  
range target, a mid-range mode for selecting an IF signal  
containing a signal from a mid-range target, and a long-  
15       range mode for selecting an IF signal containing a signal  
from a long-range target.

      7.    A transmit-receive FM-CW radar apparatus as  
claimed in claim 4, wherein said mode selector switches  
said mode to any one of said different modes which  
20       consist of a short-range mode for selecting an IF signal  
containing a signal from a short-range target, a mid-  
range mode for selecting an IF signal containing a signal  
from a mid-range target, and a long-range mode for  
selecting an IF signal containing a signal from a long-  
25       range target.

      8.    A transmit-receive FM-CW radar apparatus as  
claimed in claim 4, wherein said mode selector switches  
said mode sequentially through a short-range mode for  
selecting an IF signal containing a signal from a short-  
30       range target, a mid-range mode for selecting an IF signal  
containing a signal from a mid-range target, and a long-  
range mode for selecting an IF signal containing a signal  
from a long-range target.

      9.    A transmit-receive FM-CW radar apparatus as  
35       claimed in claim 5, wherein said specific mode is any one  
of modes consisting of a short-range mode for selecting  
an IF signal containing a signal from a short-range

target, a mid-range mode for selecting an IF signal containing a signal from a mid-range target, and a long-range mode for selecting an IF signal containing a signal from a long-range target.

5           10. A transmit-receive FM-CW radar apparatus as claimed in any one of claims 1 to 3, wherein said different modes consist of a mode for selecting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected  
10 wave, a mode for selecting an IF signal corresponding to a portion occupying up to a point about 2/3 from the leading edge of said received reflected wave, and a mode for selecting an IF signal corresponding to an entire portion of said received reflected wave.

15           11. A transmit-receive FM-CW radar apparatus as claimed in any one of claims 1 to 3, wherein said different modes consist of a mode for selecting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected  
20 wave, a mode for selecting an IF signal corresponding to a portion occupying from the point about 1/3 to a point about 2/3 from the leading edge of said received reflected wave, and a mode for selecting an IF signal corresponding to a portion occupying from the point about  
25 2/3 to a point about 3/3 from the leading edge of said received reflected wave.

          12. A transmit-receive FM-CW radar apparatus as claimed in claim 4, wherein said mode selector switches said mode to any one of said different modes which  
30 consist of a mode for selecting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for selecting an IF signal corresponding to a portion occupying up to a point about 2/3 from the  
35 leading edge of said received reflected wave, and a mode for selecting an IF signal corresponding to an entire portion of said received reflected wave.

13. A transmit-receive FM-CW radar apparatus as claimed in claim 4, wherein said mode selector switches said mode sequentially through a mode for selecting an IF signal corresponding to a portion occupying up to a point  
5 about 1/3 from a leading edge of a received reflected wave, a mode for selecting an IF signal corresponding to a portion occupying up to a point about 2/3 from the leading edge of said received reflected wave, and a mode for selecting an IF signal corresponding to an entire  
10 portion of said received reflected wave.

14. A transmit-receive FM-CW radar apparatus as claimed in claim 4, wherein said mode selector switches said mode to any one of said different modes which consist of a mode for selecting an IF signal  
15 corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for selecting an IF signal corresponding to a portion occupying from the point about 1/3 to a point about 2/3 from the leading edge of said received  
20 reflected wave, and a mode for selecting an IF signal corresponding to a portion occupying from the point about 2/3 to a point about 3/3 from the leading edge of said received reflected wave.

15. A transmit-receive FM-CW radar apparatus as claimed in claim 4, wherein said mode selector switches said mode sequentially through a mode for selecting an IF signal corresponding to a portion occupying up to a point  
25 about 1/3 from a leading edge of a received reflected wave, a mode for selecting an IF signal corresponding to a portion occupying from the point about 1/3 to a point about 2/3 from the leading edge of said received reflected wave, and a mode for selecting an IF signal  
30 corresponding to a portion occupying from the point about 2/3 to a point about 3/3 from the leading edge of said received reflected wave.  
35

16. A transmit-receive FM-CW radar apparatus as claimed in claim 5, wherein said specific mode is any one

of modes consisting of a mode for selecting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for selecting an IF signal corresponding to a  
5 portion occupying up to a point about 2/3 from the leading edge of said received reflected wave, and a mode for selecting an IF signal corresponding to an entire portion of said received reflected wave.

17. A transmit-receive FM-CW radar apparatus as  
10 claimed in claim 5, wherein said specific mode is any one of modes consisting of a mode for selecting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for selecting an IF signal corresponding to a  
15 portion occupying from the point about 1/3 to a point about 2/3 from the leading edge of said received reflected wave, and a mode for selecting an IF signal corresponding to a portion occupying from the point about 2/3 to a point about 3/3 from the leading edge of said  
20 received reflected wave.

18. A transmit-receive FM-CW radar apparatus comprising: a mixer for downconverting an IF signal; a switch for turning on and off a local signal to be supplied to said mixer; and a switch controller for  
25 controlling said switch on and off in different modes and selecting said local signal in said different modes for supply to said mixer.

19. A transmit-receive FM-CW radar apparatus as claimed in claim 18, wherein said radar apparatus  
30 comprises a plurality of said mixers, each for downconverting said IF signal, and a plurality of said switches one each provided for each of said plurality of mixers, and wherein said switch controller controls said plurality of switches in different modes and selects said  
35 local signal in said different modes for supply to said plurality of mixers respectively.

20. A transmit-receive FM-CW radar apparatus as

claimed in claim 18, wherein said mixer is a single mixer, and said switch for turning on and off said local signal is provided for said single mixer, and wherein said radar apparatus includes a mode selector for  
5 controlling said switch on and off in different modes while selecting said on/off mode by switching between said different modes.

21. A transmit-receive FM-CW radar apparatus as claimed in claim 18, wherein said mixer is a single  
10 mixer, and said switch for turning on and off said local signal is provided for said single mixer, and wherein said radar apparatus includes a mode controller for turning said switch on and off in a specific mode.

22. A transmit-receive FM-CW radar apparatus as  
15 claimed in any one of claims 18 or 19, wherein said different modes consist of a short-range mode for downconverting an IF signal containing a signal from a short-range target, a mid-range mode for downconverting an IF signal containing a signal from a mid-range target,  
20 and a long-range mode for downconverting an IF signal containing a signal from a long-range target.

23. A transmit-receive FM-CW radar apparatus as claimed in claim 20, wherein said mode selector switches said mode to any one of said different modes which  
25 consist of a short-range mode for downconverting an IF signal containing a signal from a short-range target, a mid-range mode for downconverting an IF signal containing a signal from a mid-range target, and a long-range mode for downconverting an IF signal containing a signal from  
30 a long-range target.

24. A transmit-receive FM-CW radar apparatus as claimed in claim 20, wherein said mode selector switches said mode sequentially through a short-range mode for downconverting an IF signal containing a signal from a  
35 short-range target, a mid-range mode for downconverting an IF signal containing a signal from a mid-range target, and a long-range mode for downconverting an IF signal

containing a signal from a long-range target.

25. A transmit-receive FM-CW radar apparatus as claimed in claim 21, wherein said specific mode is any one of modes consisting of a short-range mode for  
5 downconverting an IF signal containing a signal from a short-range target, a mid-range mode for downconverting an IF signal containing a signal from a mid-range target, and a long-range mode for downconverting an IF signal containing a signal from a long-range target.

10 26. A transmit-receive FM-CW radar apparatus as claimed in any one of claims 18 or 19, wherein said different modes consist of a mode for downconverting an IF signal corresponding to a portion occupying up to a point about  $1/3$  from a leading edge of a received  
15 reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying up to a point about  $2/3$  from the leading edge of said received reflected wave, and a mode for downconverting an IF signal corresponding to an entire portion of said received  
20 reflected wave.

27. A transmit-receive FM-CW radar apparatus as claimed in any one of claims 18 or 19, wherein said different modes consist of a mode for downconverting an IF signal corresponding to a portion occupying up to a  
25 point about  $1/3$  from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying from the point about  $1/3$  to a point about  $2/3$  from the leading edge of said received reflected wave, and a mode for downconverting an  
30 IF signal corresponding to a portion occupying from the point about  $2/3$  to a point about  $3/3$  from the leading edge of said received reflected wave.

28. A transmit-receive FM-CW radar apparatus as claimed in claim 20, wherein said mode selector switches  
35 said mode to any one of said different modes which consist of a mode for downconverting an IF signal corresponding to a portion occupying up to a point about

1/3 from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying up to a point about 2/3 from the leading edge of said received reflected wave, and a mode  
5 for downconverting an IF signal corresponding to an entire portion of said received reflected wave.

29. A transmit-receive FM-CW radar apparatus as claimed in claim 20, wherein said mode selector switches said mode sequentially through a mode for downconverting  
10 an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying up to a point about 2/3 from the leading edge of said received reflected  
15 wave, and a mode for downconverting an IF signal corresponding to an entire portion of said received reflected wave.

30. A transmit-receive FM-CW radar apparatus as claimed in claim 20, wherein said mode selector switches said mode to any one of said different modes which  
20 consist of a mode for downconverting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying from the point about 1/3 to a point  
25 about 2/3 from the leading edge of said received reflected wave, and a mode for downconverting an IF signal corresponding to a portion occupying from the point about 2/3 to a point about 3/3 from the leading  
30 edge of said received reflected wave.

31. A transmit-receive FM-CW radar apparatus as claimed in claim 20, wherein said mode selector switches said mode sequentially through a mode for downconverting  
35 an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying from the point about



1/3 to a point about 2/3 from the leading edge of said received reflected wave, and a mode for downconverting an IF signal corresponding to a portion occupying from the point about 2/3 to a point about 3/3 from the leading edge of said received reflected wave.

32. A transmit-receive FM-CW radar apparatus as claimed in claim 21, wherein said specific mode is any one of modes consisting of a mode for downconverting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying up to a point about 2/3 from the leading edge of said received reflected wave, and a mode for downconverting an IF signal corresponding to an entire portion of said received reflected wave.

33. A transmit-receive FM-CW radar apparatus as claimed in claim 21, wherein said specific mode is any one of modes consisting of a mode for downconverting an IF signal corresponding to a portion occupying up to a point about 1/3 from a leading edge of a received reflected wave, a mode for downconverting an IF signal corresponding to a portion occupying from the point about 1/3 to a point about 2/3 from the leading edge of said received reflected wave, and a mode for downconverting an IF signal corresponding to a portion occupying from the point about 2/3 to a point about 3/3 from the leading edge of said received reflected wave.